Remarks

Claim 2 has been amended to more clearly define the invention recited therein. The grouping of noble metals is now recited in the alternative "or" so that it is clear that one or more noble metals may be used in the practice of the method.

The Rejections

Claims 1-2, 4-7, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iizuka et al (U.S. 6,045,764) in view of Sung (2002/0131914). Claims 3 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Iizuka et al in view of Sung as applied to claims 1-2, 4-7, and 9 above, and further in view of Nara et al (U.S. 4,915,987) It is respectfully requested that each of these rejections be reconsidered and removed for the following reasons.

Applicants' Arguments for Patentability of Claims 1-9

Before considering the disclosures of the references relied on by the Examiner, it may be useful to summarize the claimed methods.

Claims 1 and 7 are the independent claims that recite methods of preparing a catalyst comprising well-dispersed particles of noble metal on surfaces of composite carrier particles. The composite carrier particles include a relatively large particle component, alumina, and a smaller component, a metal oxide. The small component metal oxide is preferably one or more of aluminum oxide, cerium oxide, lanthanum oxide, or zirconium oxide (claims 5 and 7). Nanometer size particles of the metal oxide(s) are dry coated "on the surface" of the micron sized, or larger, alumina particles to form "composite" carrier particles for the noble metal.

Dependent claims 3 and 4 recite specific dry coating steps with respect to independent claim 1. Dependent claims 8 and 9 recite like specific dry coating steps with respect to independent claim 7. Dependent claim 5 identifies specific metal oxides that are used in nanometer size. Independent claim 7 is limited to the same metal oxides.

Thus, Applicants' claimed methods comprise the formation of composite catalyst carrier particles of relatively large alumina particles carrying smaller metal oxide particles on the large alumina particle surfaces. Such unique catalyst carrier particles are preferably obtained by a dry impact process (dependent claims 3 and 8) or a dry shearing process (dependent claims 4

and 9) as summarized in paragraphs 0009, and 0016-0023 of the subject patent application. Examination of the composite carrier particles after dry mixing typically shows no abundance of individual metal oxide particles or alumina particles. The composite particles produced by the claimed methods are characterized by small metal oxide particles lying on larger alumina particles. As Applicants' specification discloses and demonstrates, noble metal particles can be very effectively dispersed for catalytic activity on the complex surfaces of such composite carrier particles.

A simple stirring together or ball milling of the large alumina particles and smaller metal oxide particles does not produce the composite carrier particles required in claims 1 and 7. This is taught in the specification of this application with respect to the Comparison Samples as described in paragraphs 0030-0032 and paragraphs 0039-0041, and reflected in the testing of the samples as summarized with respect to Figures 1 and 2. The more effective dispersion of noble metal particles on composite carrier particles by the claimed methods yields better hydrocarbon conversions in simulated automotive exhausts, particularly at the fuel rich, lower air to fuel ratio, portion of engine operation for three-way exhaust catalyst performance.

The Applicants are not aware of any prior art, including the combinations of references cited by the Examiner, that teaches or suggests the inventions recited in claims 1-9 of this application.

The References

Contrary to the Examiner's characterization of Iizuka et al '764 patent disclosure, the Hitachi workers do not teach a practice that will produce Applicants' composite catalyst carrier particles. The following critical differences are noted.

1. Iizuka (hereinafter substituted for Iizuka et al) does not teach a method or intention of making a composite catalyst carrier including nanometer size metal oxide particles coated on the surface of micron sized or larger, alumina particles.

2. Iizuka does not teach a form of mixing that could deposit small particles on the surfaces of larger particles to make a composite catalyst carrier. Iizuka calls for a dry or wet kneading method, using an automatic mortar, a ball mill, etc (col.5, lines 14-16). But Iizuka does not do it to coat small particles on larger ones. And as Applicants have clearly demonstrated

such mixing practices do not accomplish their goals when trying to coat nanometer sized metal oxide particles on micron sized alumina particles.

3. The Examiner refers to Iizuka at column 12, lines 25-40. There **cerium nitrate** crystals, not **cerium oxide** particles, of unspecified particle size are dry mixed with gamma-alumina of six micrometer size. There is no suggestion that the cerium nitrate particles are coated on the alumina particles. And the mixture is then kneaded with water. The water will dissolve cerium nitrate and disperse it on the alumina particles for drying and calcining. This practice is not a teaching or suggestion of Applicants' claimed processes.

Thus, contrary to the Examiner's assessment, the difference between Iizuka and the claimed methods is far greater than the particle size of Iizuka's cerium nitrate crystals.

The Sung published application is cited for its disclosure of a mixture of (a) nanometer sized particles and (b) a platinum group metal dispersed on a refractory metal oxide support. There is no teaching or suggestion in the Sung publication of dry coating cerium oxide particles (or other metal oxide particles) on large alumina particles by Applicants' method to make a composite catalyst carrier.

The combination of Iizuka and Sung do not provide any suitable disclosure for the rejection of any of claims 1-9. The rejection of claims 1-2, 4-7, and 9 should be reconsidered and removed.

The Nara et al '987 patent is combined with Iizuka and Sung in rejection of claims 3 and 8. As stated in Applicants' specification, Nara et al disclose a mixing machine suitable for use in the practice of their claimed methods. But the Nara et al patent does not teach or suggest coating alumina particles with nanometer sized metal oxide particles to make a composite catalyst carrier for one or more noble metals. And, for the reasons presented above, the Iizuka and Sung disclosures do not teach or suggest Applicants' claimed methods. The combination fails as a basis for the rejection of claims 3 and 8. This rejection should be reconsidered and removed.

Claims 1-9 are clearly patentable over the prior art including the three texts relied upon by the Examiner. Accordingly, it is respectfully requested that the rejections of claims 1-9 be reconsidered and removed, and the case passed to issue.

Respectfully Submitted,

George A. Grove

George A. Grove, Reg. No. 23023
Reising, Ethington, Barnes, Kisselle, P.C.
P.O. Box 4390
Troy, Michigan 48099-4390
248-689-3500

CERTIFICATE OF MAILING

I hereby certify that this correspondence is, on the date shown below, being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on: 5/24/05.

Julia D. Snell

Julia D. Snell
Assistant to George A. Grove